





# Appendicitis in Children.

BY

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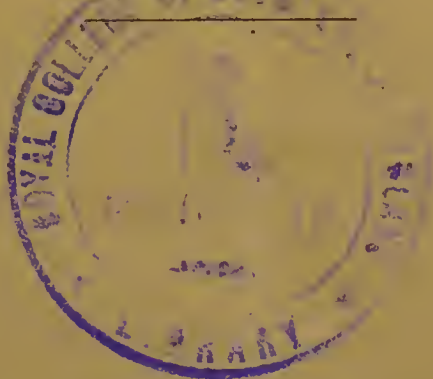
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## APPENDICITIS IN CHILDREN.\*

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I HAVE selected the subject of Appendicitis in Children as my contribution before this Section for the following reasons: First, because the disease is one which occurs frequently in early life and, from some similarity of symptoms, is likely to be confused with and mistaken for some one of the various intestinal disturbances peculiar to children; second, because the gravity of the disease is such that upon its early recognition depend in a great degree the chances of recovery; third, because I desire to advocate the removal of the appendix in acute primary attacks as soon as the disease is recognized, where there has been no decided response to judicious medical treatment, and between attacks in all recurrent cases.

In a paper read before the last meeting of the American Surgical Association I maintained that all inflammations located in the right iliac fossa had their origin in

\* Read before the Section in Diseases of Children of the Pan-American Medical Congress at its first meeting.

the appendix, such a conclusion being the inevitable result of observations at both the operating and post-mortem table. I also proposed that the terms typhlitis, perityphlitis, and paratyphlitis should be expunged from the medical vocabulary as being misleading in their character and as presenting a classification which is anatomically unfounded and which clinically is incapable of demonstration.

I would therefore group under the term appendicitis all inflammatory conditions of the right iliac fossa, believing that in so doing a clearer conception will be formed of the true pathological conditions present, and that a common treatment—that of early operative interference—will be adopted universally.

All cases of appendicitis may be classified under the following heads: Catarrhal, ulcerative, which may be the result of a circumscribed catarrhal inflammation or of an obstruction due to the presence of a foreign body, as a faecal concretion, an enterolith, a stricture, etc.; perforative, an advanced stage of the ulcerative type; tubercular; and relapsing or recurrent.

*Pathological Changes.*—The pathological changes occurring in cases of appendicitis vary according to the exciting cause, but are usually those common to inflammations of the intestinal tract and may present any of the conditions from a simple lymph exudate to a pus formation.

*Ætiology.*—Inflammation of the appendix may be the result of either predisposing or exciting causes. Among the predisposing causes age is an important factor, fifteen per cent. of all cases occurring under fifteen years. The youngest patient I have met with was a child two years old. Males are more prone to the disease than females are. A tubercular diathesis is not uncommonly the remote cause of a suppurative appendicitis. Chronic constipation is a fur-

ther predisposing cause, which may induce either a catarrhal or an ulcerative type. Among the exciting causes may be mentioned the presence of seeds, enteroliths, faecal concretions, inspissated mucus, particles of undigested food, traumatism, and exposure to cold or dampness, but the most frequent exciting cause is the result of a previous attack.

*History and Symptoms.*—The onset is usually sudden, constipation the rule rather than the exception. We may be able to elicit a history of one or more previous attacks or of the rapid ingestion of some indigestible substance or overloading of the stomach.

The symptoms of appendicitis in its incipency are not by any means definite in all cases. The prominent and constant symptoms are pain, vomiting, and tenderness. The pain, which is at first paroxysmal, in this respect resembling colic, is referred to the umbilical and epigastric regions, and in seventy-two per cent. of all cases appears within twenty-four hours. Later it becomes continuous, and is localized in the right iliae fossa in fifty-four per cent. of all cases. Vomiting is present from the first, becoming uncontrollable if the case does not yield to treatment. The vomited matter consists first of the contents of the stomach, later of bile, and finally, if a plastic peritonitis supervenes by which the coils of intestine are immobilized from the resultant deposit of lymph, of stercoraceous matter in those cases in which the intestinal tract has not been emptied. Ordinarily the vomiting of stercoraceous matter is indicative of acute intestinal obstruction, yet we see stercoraceous vomiting in advanced and hopeless cases of appendicitis. The tongue is furred and later in the disease becomes dry with the deposit of sordes upon the teeth. There is extreme thirst, with a temperature varying from 102° to 104° F. and a high pulse rate. The

bowels are usually confined ; it is, however, not uncommon to have the disease ushered in with diarrhœa. The presence of sick stomach, diarrhœa, and pain coming on suddenly are suggestive of enteritis, the affection with which acute appendicitis in its incipiency is most likely to be confounded. As the affection advances, the child frequently favors the affected side and lies with the thigh of the corresponding side flexed upon the abdomen. Frequency of urination is often a prominent symptom, being due evidently to the involvement of the sympathetic nerves. Examination by palpation reveals general tenderness over the affected area, while the point of greatest intensity usually corresponds to the so-called McBurney point, providing the appendix occupies its most common position, arising from the postero-internal aspect of the base of the cæcum. I recall one case in particular where the greatest point of tenderness was immediately above the middle of Poupart's ligament. This, as demonstrated at the operation, corresponded to the angle of curve in the appendix, which arose from the postero-external aspect of the base of the cæcum and descended in front of the latter as far as its apex, where it curved abruptly upward. When general peritonitis is present early, as in the perforative variety of the disease, notwithstanding that there is a very general abdominal tenderness, yet, upon deep pressure, a point in the right iliac fossa corresponding to the appendix can be made out which is much more painful than any other point in the abdomen. Palpation also detects very decided resistance offered by the abdominal muscles of the affected side. In many cases an indurated mass is to be felt, which is circumscribed or diffused, particularly in the direction of the linea alba and of the pelvis. Superficial percussion in the early part of the disease yields negative information, while deep percussion, if the case steadily advances, will



reveal dullness and later flatness. Deep rectal as well as vaginal examination I do not think of much diagnostic value, early in the disease at least. In those cases where the appendix projects into the pelvis it may be of some assistance. If a mass can be felt through the rectum or the vagina, palpation of the abdominal walls at the same time may elicit fluctuation. Suppuration is not always readily detected, as fluctuation is difficult to elicit on account of the unyielding abdominal wall. Yet I have seen it well pronounced many times. Œdema of the overlying abdominal walls is of great diagnostic value as indicating the presence of deep suppuration. If, associated with the presence of a mass in the right iliac fossa, there are decided chills, or even chilly sensations with sweating, it is quite evident that pus is present.

*Diagnosis.*—The establishment of a diagnosis depends on the character of the symptoms, the clearness of the history, the duration of the disease, and the previous treatment, as the administration of opiates to relieve distressing pain may mask many symptoms which would otherwise be prominent. The affections with which appendicitis is most likely to be confounded in children are enteritis, involving all the coats of the intestine (entero-peritonitis); acute mechanical intestinal obstruction; perinephritic abscess; abscess of the kidney, and especially so if the kidney be a floating one, as I have once observed; psoas abscess; iliac abscess; abscess of the abdominal parietes; hip disease; hepatic and renal colic. In enteritis involving all the coats of the intestine the disease is ushered in by a diarrhœa of a more or less severe type, in which the stools are watery and mucoid in character. This is accompanied by pain of a colicky nature referred to that portion of the abdomen corresponding to the situation of the affected coils of intestine, also by the absence of abdominal

distention. Later, however, when the muscular and serous coats are invaded by the inflammatory process, as a consequence of the infiltration and the involvement of the sympathetic nerve filaments supplying the coats of the bowel, paralysis of the bowel occurs which results in distention. Diarrhœa is now no longer present, but, on the contrary, absolute constipation with inability to pass flatus. Vomiting occurs which, if the disease is not relieved, becomes stercoraceous. Ordinarily there would be but little trouble in differentiating between this form of enteritis or entero-peritonitis and appendicitis if the symptomatology of the latter affection is borne in mind, in addition to what has been said about the physical signs elicited by careful abdominal palpation in cases of appendicitis.

In acute mechanical intestinal obstruction the two most common forms met with in children are invagination and strangulation by bands; the onset of the symptoms is more abrupt and severe than in appendicitis. In invagination, as in strangulation by bands, the pain, which is most intense and at first occurs in exacerbations, is referred to the seat of the obstruction, or more commonly to the umbilicus, and not concentrated in the right iliac fossa, as is the case in appendicitis when the disease is well established. There is absolute constipation with inability to pass flatus. Vomiting is an early symptom in both forms of obstruction, which, if not relieved, becomes stercoraceous. When peritonitis supervenes there is very little effort attending the vomiting. Properly speaking, the patient at this stage of the disease regurgitates fæcal matter caused by the reversed peristalsis. There is absence of fever in strangulation by bands and in invagination unless the child survives until the invaginated portion of the bowel commences to undergo inflammation, which causes ulceration and affords Nature a means of disposing of the intussusceptum and thus establishing a spon-

taneous cure. In invagination the presence of a movable tumor, the most common site of which is to the left of the middle line, but not always to be made out on account of the distention, while in appendicitis a tumor, if present, is fixed and always occupies the right iliac fossa, are important differential points. In invagination a discharge of blood and mucus from the rectum, and in many instances the presence of a tumor, may be detected upon making a digital examination of the rectum. With the development of peritonitis in acute intestinal obstruction there is marked distention of the abdomen.

Collapse is an early symptom in acute intestinal obstruction, while not so in appendicitis unless it be of the perforative or fulminative variety; but even then it is a later manifestation than in obstruction. In perinephritic abscess the location of the swelling, the presence of œdema in the loin, and the absence of bowel symptoms, are important differential factors. In many cases of perinephritic abscess the trouble is preceded or accompanied by the presence of pus as well as other abnormalities in the urine.

This is not, however, true in those cases which have their origin independent of the kidney, as when due to constipation, traumatism, etc. In perinephritic abscess, as in some cases of appendicitis, owing to the relation between the perinephritic tissue, the appendix, and the psoas magnus muscle, flexion of the thigh upon the abdomen is a symptom common to both affections. If a doubtful case should arise where it would seem to be impossible to differentiate, better than introducing an exploring needle or an aspirating needle, either of which procedures under these circumstances I regard as most unsurgical and attended by no little danger, I would advise an exploratory incision in the loin before cutting through the abdominal wall anteriorly; this could not possibly result in any harm, even

if the perinephritic space be found intact; nor would it interfere in the least with immediately cutting down upon the appendix. In abscess of the kidney the same train of symptoms is largely present as in perinephritic abscess—namely, a mass in the loin corresponding to the position of the kidney, pus in the urine, history of renal colic, with perhaps the passage of small crystals of uric acid; yet to have renal colic it is not necessary that a stone or a fragment thereof should pass through the ureter, but simply a plug of fibrin or inspissated mucus, as I have seen upon several occasions in cases of pyelitis. In kidney abscess, nausea, with sometimes vomiting, is a not inconstant symptom. In the absence of urinary symptoms, abscess of the kidney, and particularly if it be one of a floating kidney, the differential diagnosis is necessarily more difficult. In the latter instance, however, the tumor will be movable—a point to be borne in mind. I have recently operated in the case of an acute suppuration of the kidney where the urine was normal and where the diagnosis was made purely upon the anatomical situation of the swelling.

In psoas abscess the onset is slow, with little or no fever, usually, though not always, accompanied by evidence of disease of the vertebræ, absence of pain, tenderness, and bowel symptoms.

There may be flexion of the thigh of the corresponding side due to the muscular irritation. What has been said of psoas is equally true of iliac abscess, if dependent upon bone disease. Should a collection of pus in the iliac fossa be dependent upon disease of the uterine appendages, a vaginal examination would reveal the cause. In the latter variety of abscess, however, the swelling usually holds a lower position than abscess the result of disease of the appendix, it being near Poupart's ligament—in fact, immediately above it.

*Abscess of the Abdominal Wall.*—Between abscess of the abdominal wall and that caused by appendicitis there should be but little difficulty in arriving at a correct conclusion. If the collection is in the superficial fascia it will be circumscribed, while if between the abdominal muscles it is likely to be diffused. The purely local character of the abdominal abscess, the swelling moving with the abdominal walls, the absence of intestinal symptoms, the presence of local and constitutional evidence of pus, coupled with the history of the case, should be enough to render a differential diagnosis possible.

*Hip-joint Disease.*—The presence of the characteristic deformity, inability to execute the normal movements of the joint, pain referred to the knee, arching of the lumbar spine when the limb is brought into the fully extended position, absence of intestinal symptoms. If there is still doubt, the administration of an anæsthetic will suffice to dispel it.

*Hepatic Colic.*—In hepatic colic the painful area is usually higher in the abdomen, radiating toward the shoulder, most severe over the region of the gall bladder, and usually followed by jaundice.

*Nephritic Colic.*—In nephritic colic a history of previous attacks may often be obtained; the origin of the pain is deep in the upper loin, radiating in the line of the ureter, with retraction of the testicle, diminished urinary flow, with blood or pus, and a sudden termination of the attack. Retraction of the testicle may occur in appendicitis, due to irritation of the genito-crural nerve.

I recall a case of a physician in which the diagnosis of renal colic had been made, and in which the ureter was supposed to have been ruptured by the passage of a calculus. The autopsy revealed a gangrenous and perforated appendix with diffuse suppurative peritonitis.



*Prognosis.*—The age of the patient has a material effect upon the prognosis; the earlier in life it occurs, the less resisting power is exhibited by the patient. Sex does not seem to be a factor.

Where an abscess forms and ruptures or perforation takes place, and the contents of the bowel escape and are unconfined by a wall of lymph, general peritonitis is rapidly established, terminating these cases with a fatal uniformity. The most favorable point for spontaneous evacuation of the contents of an appendicular abscess is into the cæcum. Rupture into the rectum is also followed by recovery in the majority of cases. Rupture into the bladder is fatal in about fifty per cent. of the cases. The most favorable results have been recorded where early operative interference was instituted, the mortality under this plan of treatment being but six per cent.

*Treatment.*—Medical treatment: The first indication to be fulfilled in a case of appendicitis, or even of a supposed case, is to obtain a free action of the bowels. This is best accomplished by the administration of small and repeated doses of salines—preferably Rochelle salts—or, if the stomach is not tolerant to salines, small doses of calomel. The free evacuation of the bowels, not drastic purgation, serves the purpose of clearing the alimentary canal of all foreign and irritable substances—as particles of undigested food, etc.; relieves the congested blood-vessels, thus modifying the degree of the subsequent inflammation; and again fulfills a most important indication in having the bowels in the most favorable condition for operation in the event of its necessity. I can not emphasize this important part of the treatment too strongly, as upon it, I believe, largely depend the chances of the patient's recovery. Certainly, in my experience, the bulk of the cases I have seen recover without operation have been those where it was most thor-

oughly carried out, and in the cases operated upon the largest percentage of recoveries have been in those where the bowels were not allowed to be confined. Where there is great pain, as we frequently see, in addition to the administration of salines or calomel, as the case may be, we may be forced to use an anodyne, and, if so, it should be given in the smallest possible dose.

The pain in appendicitis, which is colicky in nature, is due first to the muscular contraction of the appendix and the bowels, and in the majority of instances is provoked by irritation within both; therefore is not the evacuation of the intestines of their irritating contents urgently called for? Are they not, in other words, asking to be relieved? This being so, will not purgation take the place of an anodyne, as a hypodermic of morphine, which is so often and indiscreetly given? In other words, the best anodyne is the repeated dose of salts or calomel, which does more than any preparation of opium can do, both relieving and removing the cause of the pain. Recognizing the character of the pain, is it not possible to afford relief by hot applications to the abdomen in the shape of the hot-water bag, hot cloths, hot turpentine stupes, etc.? Internally, before giving opium, I prefer to use spirits of chloroform, carminatives, or extract of belladonna. If now relief is not obtained, then I administer a small dose of opium, and preferably by suppository, as I think we all agree that opium given in this form is less liable to cause sick stomach. Sick stomach is so frequently provoked by morphine given hypodermically that it is often difficult to say whether the nausea or vomiting is due to the morphine or to the disease. Further, there is no disputing the fact that opium or any of its preparations brings about a paretic condition of the bowel and thus favors distention, an obstacle difficult to contend with when endeavoring to elicit a mass.

If the case be catarrhal, the presence of congestion of the mucous lining of the appendix is the exciting factor in occasioning contraction of the muscular coat, which is the direct cause of the initiatory pain. Again, as has already been noted, emptying the bowels freely both removes an additional factor in exciting contraction of the muscular coat of the appendix, as well as depletes the circulation and renders the canal more patulous and better able to free itself of mucus, which, if retained, becomes inspissated.

The presence of inspissated mucous in catarrhal appendicitis is liable to lead to an ulcerative type of the disease. While I do not believe the good derived from purgation in the obstructive form of appendicitis is equal to that in the catarrhal type, yet I do not know of any other form of medication capable of accomplishing the same amount of good. There is some hope, too, in emptying the cæcum that the orifice of the appendix may be rendered patulous and the expulsion of the foreign body facilitated. In the perforative and explosive or fulminative varieties of the disease, the latter being only a difference in degree of the former, active purgation would be ill advised on account of the fear of hastening and making greater the extravasation of fæcal matter. The treatment by free evacuation of the bowels may be thought to be erroneous on account of the increased peristalsis resulting therefrom aggravating the already existing inflammation. The use of leeches and blisters is advocated by many in preference to purgation to accomplish depletion of the circulation. I must confess this is not in accord with my experience. Blisters, I think, are particularly objectionable on account of the infiltration of the skin they occasion, which both interferes with palpation and the recognition of pus by the œdema of the abdominal walls.



The question of diet throughout the disease is important, and it should consist—until the patient is convalescing at least—of peptonized milk, koumyss, milk and Apollinaris or carbonated lithia water, liquid beef peptonoids, and concentrated beef tea, the latter being all the more indicated on account of its laxative effect. Buttermilk I find very grateful to many patients.

As to the propriety of the removal of the appendix in cases of recurrent appendicitis, there is, in my mind, no doubt. While I am willing to admit that my experience has taught me that acute attacks of recurrent appendicitis are less fatal than primary appendicitis, yet I can not see how this argues against removal of the appendix between attacks, the period for elective operation. I am unable to understand the philosophy of the argument that because a patient has survived a number of attacks of recurrent appendicitis, the appendix should not be taken out, since each recurring attack may possess elements of danger unknown to us which may deprive our patient of his life. Those of us who have observed these cases carefully know that many are the subjects of chronic invalidism. The percentage of mortality in operations for recurrent appendicitis in skilled hands is less than one per cent. The absence of inflammatory conditions so simplifies the operation that its after-conduct entitles it to be classed as a simple wound. This same absence of acute inflammatory condition which relieves the necessity for drainage and the consequent impairment of the integrity of the abdominal walls lessens in a great degree the liability to ventral hernia.

The after-treatment of these cases is so simple that it deserves special mention. It consists during the first three days of alimentation alone, absolutely no opiate, and at the expiration of this time, if the bowels have not moved voluntarily, of the administration of one-tenth-grain doses of

calomel every hour or two until a desire to defecate is produced, when an enema is given.

Before discussing the operative treatment of this disease and while advocating the most radical methods, I desire to disclaim any intention of declaring that all cases where the ordinary medical treatment of the general practitioner has failed to afford relief are cases for immediate operation, as I believe that such a decision should rest only with an experienced surgeon, who may have carefully observed the progress of the case. Further, that the operation should be done by one who is thoroughly prepared to dispose of any of the unlooked for conditions which are likely to be met with in any case. The skill required for the rapid and thorough performance of appendicial operations must be of the highest order, as time lost and prolonged etherization (by which the patient becomes, as it were, water-logged) during an operation may be just sufficient to turn to a fatal termination what would otherwise have been a successful result. This is of special importance when operating upon children, as we well know they do not bear prolonged etherization or operation. In the gravest types of the disease, when there is a sudden abatement of the symptoms, the attending medical man or surgeon, as may be, must not congratulate himself upon the rapid recovery of his patient and overlook the fact that this is a forerunner of perforation. On the contrary, if operation has not already been entertained, the strongest indication for its immediate performance now presents itself. Following this period (which is practically one of shock), in the course of a few hours—usually twenty-four—a general peritonitis has developed and the golden opportunity for offering the patient his only chance for relief is a thing of the past.

The technique of the operation for appendicitis where abscess exists varies by reason of the different local condi-

tions found. When the abscess is circumscribed and shut off, after the pus has been evacuated and the cavity irrigated, if the appendix can not readily be found, it is not judicious to make a prolonged search for it, by which the limiting wall may be broken through and a communication with the general peritonæum established. In this class of cases, however, I have been fortunate enough in most cases to find the appendix and remove it without breaking through the abscess wall. This is always more satisfactory to the surgeon than to complete the operation by simply draining or packing the abscess cavity, and it removes what may be the cause of one or more attacks of the relapsing variety of the disease. When the abscess is in communication with the general peritoneal cavity a more prolonged search for the appendix may be made with less risk than in the preceding state, but the patient's general condition is usually so bad under these circumstances as to make it unwise to keep him under the effect of the anæsthetic any longer than is absolutely necessary.

The points I observe in making the incision for the removal of the appendix in acute cases where there is present a mass, be it pus or exudate, are the following: When the loin is rendered prominent by the mass or is the seat of œdema, I take it as an indication that the appendix holds a post-cæcal or an external antero-lateral position, or that it comes off from the apex of the cæcum, and I carry the incision parallel with and a short distance above the outer third of Poupart's ligament, prolonging it outward if necessary. When the mass presents itself well to the inner side of the anterior superior spine of the ilium, I carry the incision through the semilunar line—rather, through the rectus muscle immediately to the inner side of the semilunar line. The wound when carried through the muscle heals more solidly, and therefore there is less likelihood of the

development of a ventral hernia than when made through the semilunar line.

In acute cases the treatment of the stump of the appendix will depend on its situation and the mobility of the cæcum; if the latter has become fixed through plastic adhesions, and it is not deemed advisable to make the manipulation necessary to bring it well up into the wound, the appendix is tied off *in situ*.

If, however, it is possible to present the appendix in a favorable situation, a circular incision is made through the serous coat half an inch from the cæcum, and the serous coat then stripped back for the space of a quarter of an inch; the appendix is then tied off with fine silk, the serous covering replaced with edges inverted, and brought together with a Lembert suture. The latter disposition of the appendix is decidedly the most favorable, and is the method which we are enabled to employ in cases of recurrent appendicitis, with few exceptions. In cases of abscess the pus cavity, when limited, is thoroughly irrigated and drained with either tubes or iodoform gauze, or both combined. When the peritoneal cavity has become generally involved, irrigation and drainage are employed in the usual way.

*After-treatment.*—The after-treatment in acute cases consists in the administration of small doses of salines repeated sufficiently often to free the bowels, with the same diet as before mentioned, alimentation being allowed immediately on cessation of ether emesis.

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